REMARKS/ARGUMENTS

Reconsideration of this application is respectfully requested.

Claims 1, 2, 9, and 17-26 are pending in the application.

Claims 1, 2, 9, and 17-26 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Arhancet (U.S. Patent No. 5,907,071) in view of Higgins et al. (U.S. Patent No. 4,033,829).

Arhancet discloses the inhibition of the polymerization of vinyl aromatic monomers such as styrene by the addition of a composition of a stable hindered nitroxyl radical and an oxime compound.

The Examiner has stated:

> "Arhancet discloses a method for inhibiting premature polymerization of vinyl aromatic monomers. The monomers are distilled in the presence of nitroxyl inhibitors (2,2,6,6-tetramethyl-1-piperidinoxy) at a temperature of 110° C and under reduced vacuum. The formula of the inhibitor of Arhancet is the same as the claimed formula. (See col. 1, lines 16-17; col. 2, line 10 through col. 3, line 7; claims 6 and 8). ...
>
> Regarding claim 1, Arhancet does not disclose a step of recycling the inhibitor to the distillation column."

This last sentence is precisely the point. Arhancet teaches only using fresh nitroxyl compounds (i.e., not recycled) in combination with an oxime compound. As pointed out on page 13 of the present application, at lines 20-23,

"It is known in the industry that the recycling of streams utilizing nitroxyls as polymerization inhibitors in plants employing temperatures in excess of about 115°C causes loss of inhibitor efficiency, such that the tar recycle leads to a higher polymer content than would be expected or desirable."

The present invention is directed to the discovery of a means to substantially overcome this problem of the decreased efficiency of recycled *nitroxyl* inhibitors.

In an attempt to overcome this deficiency of Arhancet as a reference, the Examiner has cited the Higgins et al. reference.

According to the Examiner:

"Higgins discloses a process for production/purification of an unsaturated monomer feedstock by contacting the feedstock with inhibitors in a distillation/separation zone to produce a product stream containing the inhibitor and the unsaturated monomer which is then recycled back to the distillation/separation zone. Higgins also discloses that the process is operated on either a continuous or batch basis at an overhead pressure of the distillation column of 414 mm Hg and the product stream contains by-product impurities such as polymers. (See abstract; col. 1, lines 46-64; col. 3, line 11 through col. 6, line 66)

Regarding claim 1, Arhancet does not disclose a step of recycling the inhibitor to the distillation column. However, Higgins discloses a process for production/purification of an unsaturated monomer wherein the inhibitor is recycled back to the distillation column (see the Figure). Therefore, it would

have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Arhancet by recycling the inhibitor back to the distillation column as taught by Higgins because the recycling step would cut down the cost of fresh inhibitor."

Higgins et al. disclose the inhibition of styrene polymerization during the distillation thereof by incorporating therein, in an amount sufficient to inhibit polymerization thereof, a *dinitrophenol* solution recovered from styrene still residues or tars resulting from the distillation of styrene in the presence of *dinitrophenol.*

As pointed out previously in the prosecution of this application, dinitrophenol is *not* a *nitroxyl-containing* compound and thus this patent provides no teaching of the difficulties encountered in using nitroxyl-containing compounds as inhibitors, nor does it suggest that problems involved in using nitroxyl-containing compounds as inhibitors can be overcome by recycling a stream *containing such inhibitors* at temperatures no higher than about 110°C *and* at pressures below 760 mm Hg, as required by the present claims. On the contrary, the patent teaches in column 4, at lines 38-41 that the *distillation column* was operated at an overhead pressure of 414 mm Hg which *resulted in a bottoms temperature of approximately 131° C.* This is precisely the kind of distillation temperature the present Applicants have taught is to be avoided.

Further, and even more important, Higgins et al. teach that by virtue of their recycling process, a solution of their recycled dinitrophenols is provided that is *more effective* than the commercial dinitrophenols ordinarily employed in retarding polymerization during the distillation of styrene. See column 1, lines 61-66 and column 4, Example 3. Thus, a person

of ordinary skill in the art, aware that, as pointed out above, it is known in the industry that the recycling of streams utilizing nitroxyls as polymerization inhibitors in plants employing temperatures in excess of about 115°C causes *loss* of inhibitor efficiency, such that the tar recycle leads to a higher polymer content than would be expected or desirable, could hardly be expected to think of following the teaching of Higgins et al. to supplement the deficiencies of Arhancet. In other words, the behavior of dinitrophenols and nitoxyl compounds are so totally different that the skilled practitioner would have no motivation whatsoever to combine the teaching of Higgins et al. with the teaching of Arhancet to come up with the present invention.

The Examiner continued:

> "Regarding claim 9, Arhancet does not specifically disclose that the distillation is a continuous operation. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Arhancet by operating the process continuously because Higgins teaches that similar results would be expected when the distillation is operated in either continuous or batch mode."

It is not to be denied that the use of batch and continuous operations are well-known in the art. However, the use of a continuous operation wherein the continuity includes the recycling of a nitroxyl inhibitor presents special problems with regard to effectiveness that one does not encounter with other inhibitors, such as dinitrophenols. Neither Arhancet nor Higgins et al., either alone or in combination, provides any teaching as to how these problems can be overcome.

Finally, the Examiner has stated:

> "Regarding claim 18, Arhancet does not specifically disclose that the inhibitor is a blend of two nitroxyls. However, each of the nitroxyl-containing inhibitors of Arhancet has an equivalent function. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Arhancet by using a blend of two nitroxyls because it would be expected that the mixture of the two nitroxyls would have similar results as a single nitroxyl inhibitor."

In the real world, where economics is a supreme consideration, scientists and engineers don't go around looking for ways to make commercial processes more complex in the absence of countervailing benefits that make the added cost of the more complex system acceptable. Here, Arhancet has taught the use of a single nitroxyl compound; there would be no motivation for the person in charge of a styrene purification process to simply throw in a second or third, unless he was aware of some good reason for doing so in the light of the increased cost it would entail. No such good reason is provided by Arhancet.

Accordingly, it is requested that the rejection of claims 1, 2, 9, and 17-19 under 35 U.S.C. 103(a) as being unpatentable over Arhancet et al. in view of Higgins et al. be withdrawn.

In view of the foregoing, it is submitted that this application is in condition for allowance and an early Office Action to that end is earnestly solicited.

Respectfully submitted,

18 MAR 05
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